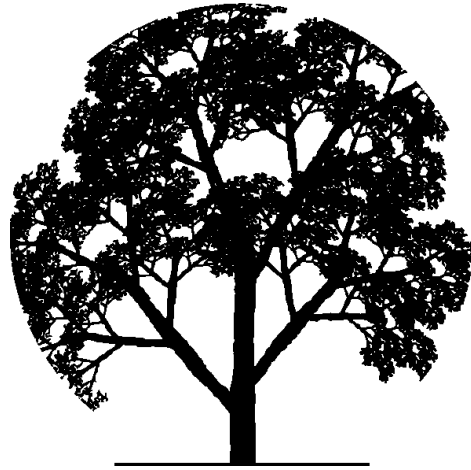


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**Formal Description of Perceptive and Mental
Verbs in Bulgarian Language
(Word Sense Disambiguation)**

Abstract of the dissertation for the
acquisition of the educational and scientific degree "Doctor"

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1. Introduction

The intensive development of modern technologies determines the need for a new understanding of traditional objects of linguistics. The main motivation for the research lies in the lack of a comprehensive study in Bulgarian language on the relation between the verbs of perception and the semantic class of mental predicates.

The **object** of the present study are those words whose first and basic sense marks sensory perception. In the focus of our interest are those of the verbs that also express cognitive content in some of their senses, as well as their distinction. S. Moiseeva claims that "in modern psychological and linguistic research perception is considered the cognitive process that forms the sensory level of knowledge, which is the basis for the overall cognitive activity of a person" (Moiseeva 2005: 24).

As the topic of the dissertation was initially formulated as "Word Sense Recognition and Disambiguation", and later limited to its study within perceptive and mental predicates, several issues were taken into account:

(1) Where semantic ambiguity arises in these 2 classes of verbs, namely in the semantic derivation from perception to mentality. In the course of the research no data were found to illustrate the process in the opposite direction. Thus, as far as the plan of expression is concerned, the two classes under study exhibit an inclusion relation.

(2) The development of the lexical-semantic system and the leading role of the semantic aspect in the research gave rise to the need of considering the senses of perceptive predicates, analyzing and describing their intersection with cognitive predicates. This presupposes the possibility for an automatic WSD system being able to recognize those graphic expressions that have heterogeneous content and to point out one of the senses.

(3) The typological derivational dependence of the sense extension from perception to mentality necessitated that the research be built mainly on perceptive predicates, while outlining the semantic connections with the field of cognition, and in the course of the research, with other semantic classes expressed in the same way as the perceptive ones.

The meaning of a verb stands as a centre of this research, and its graphic realisation is the means for semantic disambiguation.

In general, the definitions of perceptive predicates are similar, although the scope of the semantic class varies from author to author. K. Horie defines perception predicates as "those which primarily encode the acquisition of sense data through the senses", distinguishing them from cognitive ones that "primarily encode mental manipulation of information / ideas which do not have to have a perceptual basis" (Horie 1993: 3). S. Moiseeva defines perceptive vocabulary as "the result of the direct interaction of a person and the world, which carries information about the world and the ability of the person to operate with it in their practical activities" (Moiseeva 2005: 4-5). E. Paducheva notes that the class of perception verbs has blurred boundaries (Paducheva 2004: 198), including verbs

naming components like *perception, Observer, sensory organ, observed movement or state, loss of sensory ability*, and others. (Paducheva 2004: 198-202).

For the sake of completeness of the results the exposition follows the opinions of E. Paducheva, S. Moiseeva and A. Viberg and in addition to the traditionally studied predicates for extraception (external perception) the present study includes verbs for interoception (internal perception), proprioception (sensations concerning body position, efforts and activities), potential perception (verbs that do not name the act of perception itself, but mark the possibility of the object to be perceived by the senses (*изглеждам, блестя, светя*)).¹

The subject of the research are linguistic examples in indicative mood, structured as simple or complex sentences. The connection between the realisation of complements in complex sentences and the morphological features of the verb in the main clause will remain outside the scope of the research at this stage.

The exposition aims at the exact and comprehensive description of the semantic features of the predicates in the considered class and their environment. It encompasses a certain class of constructions - the arguments of perceptive predicates and of the meanings that represent the field of mentality.

The **goals** of the author for the development and confirmation of the hypotheses are:

- Contribution to the comprehensive description and typology of perceptive predicates;
- Comparative analysis of the argument- and complement- characteristics of predicates with emphasis on those representatives of the perception verbs, which could be found in both groups (perception and mentality) in order to support the automatic word sense disambiguation;
- Typological representation of the frames and frame elements of perceptive verbs.

The descriptive focus unfolds in the semantic and structural characteristics of predicates and their arguments, as well as their correlation with semantic types. Of particular interest in view of the word sense disambiguation are predicates such as "see", which in addition to pure perception can also name a cognitive process (in the most general case with the meaning of *realise, understand* and their derivatives). The senses, whose motivation depends on the specific grammatical and paradigmatic features of verbs, will remain outside the focus of the research.

The specific **tasks**, envisaged to achieve the goals are:

1. Presentation of fundamental theoretical statements regarding the lexical meaning of a word and its main ways of coding.
2. Defining the automatic word sense disambiguation and an overview of the basic approaches of its implementation, which will help build a strategy for the formal description of predicates.

¹ The topic of the focus and periphery of the semantic class of perception will be presented in more detail in Chapter 4.

3. Analytical review of existing semantic classifications of predicates in general and of perception predicates in particular.

4. Description of the semantic class of verbs of perception - typology and subclasses.

5. Highlighting the semantic range of polysemous verbs.

6. Analysis of the connections between the words naming perceptive predicates and other semantic classes with emphasis on the cognitive field.

7. Representation of the syntactic realisation of the different senses (perceptive and mental) with the help of the frame theory.

8. Description of the semantic restrictions and grammatical realisations of the frame elements in different meanings.

9. Specifics of the formal indicators in the realisation of sensory (prototype) and non-sensory (non-prototype) meanings.

Based on what has been said so far, we rely on the following working **hypotheses**:

1. There is a close connection between the realisation of senses and the semantic-syntactic features of the environment of the perception predicates.

2. Predicates that are perceptive in their basic meaning, but are also used with a cognitive one, should encode different ways in which their arguments and complements express the different senses.

3. The description of word senses of perceptive predicates, which also develop cognitive semantics, and of their arguments and syntactic functionality in the different meanings would lead to greater clarity in the automatic word sense disambiguation.

Sources of examples: Bulgarian National Corpus, grammar books, fiction, Internet, other research and constructed examples to illustrate some theses. For the purposes of the detailed description and precision of the study, the abundance of excerpted material on which the analysis is based is crucial.

The terminological apparatus includes:

The terms **perception verbs** / **predicates** have been used to name the predicates in question, as well as the Latin name **verba percipiendi**, used by a number of authors (Nitsolova 1992: 134, Mihailova-Stalyanova 2011).

To name the participants in the perceptual act:

When it comes to the performer of the perceptual act, the term **subject of perception** will most often be used in the research. Depending on the degree of his volitional participation in the situation of perception, he can belong to the agent or experiencer type. The term **observer** is also widely used in the Russian linguistic tradition (Paducheva 2000: 185). Within the framework of frame descriptions in Framenet, this participant is called a **perceiver**, sometimes transmitted in the linguistic literature as a **perceptor**. The listed terms occur variably within the authors cited in the dissertation, often even within one study.

The perceived participant in the situation is called the **object of perception**. Within the semantic role theories it is called the **Stimulus** of perception, and in the frame theory - the **Phenomenon**.

We will call **arguments** the obligatory syntactic components that a predicate selects. We rely on S. Koeva, who defines them as "obligatory descriptions of a lexical head" (Koeva 1998: 206). In his dissertation, P. Rosenbaum explores subordinate sentence structures, which he calls **complements** (Rosenbaum 1965: 4). According to R. Nitsolova, this is "a syntactic structure naming a proposition, which in the semantic structure takes the position of an argument to the main predicate in the sentence" (Nitsolova 2008: 261). We will use the term **complement** in the light of the research of P. Rosenbaum (1965: 4), M. Noonan (2007: 52), R. Nitsolova (2008: 261) and S. Koeva (2019: 57), and **complementation** - respectively - the coding and realisation of sentence arguments.

Resources

Wordnet is a lexical-semantic network suitable for machine processing, originally developed at Princeton University by a team led by George Miller (Miller 1995, Felbaum 1998). It covers a large number of nouns, verbs, adjectives and adverbs. Later, Wordnet was developed for other languages, becoming a synchronised semantic database, which through a unique identification code connects each specific concept with its counterpart in different languages. The Bulgarian version of Wordnet - Bulnet - was developed at the Department of Computational Linguistics at the Institute for Bulgarian Language "Prof. Lubomir Andreychin" at the Bulgarian Academy of Sciences and contains over 100,000 synonymous sets called synsets (Koeva et al. 2004, Koeva 2021). In addition to the main 4 parts of speech, the Bulgarian semantic resource includes pronouns, prepositions, conjunctions, particles and interjections.

Although Wordnet (<https://dcl.bas.bg/bulnet/>) will be used as the main resource, the basic verb sense is considered the first one in the Dictionary of Bulgarian Language (<https://ibl.bas.bg/rbe/>), since in Wordnet lexical senses are often not ranked in order of importance or frequency of use.

While Bulnet was used to present the semantic and paradigmatic features of predicates, the main resource used for their syntagmatic characteristics is **Framenet** (J. Rupenhofer et al. 2016). Framenet is a resource developed at the International Institute of Computer Science in Berkeley and is based on the semantics of frames. It was started under the guidance of Charles Fillmore in 1997 (Baker et al. 1998) and is essential for both theoretical linguistic research and practical natural language processing. The language resource provides a set of data for labelling of semantic roles that are used in various applications such as machine translation, information retrieval, event recognition, and more. The lexical base is a semantic network in which nodes are frames or frame elements. Semantic frames represent the conceptual structure of an event or an object and its participants. Framenet consists of 1,200 semantic frames and 13,000 lexical items illustrated by over 200,000 sentences.

Each frame is presented with its definition, frame elements, lexical units, examples and interframe relations.

Frame elements can be seen as semantic roles. They can be core and non-core, the former being essential for the realisation of the frame, while the latter are mostly descriptive (concerning time, place, etc.). Lexical units are lemmas that give rise to a situation (frame). Each sense of the same word is coded as a separate lexical unit and a different frame is assigned to it. Frames are associated with various relations indicating inheritance, subframe, causality, inchoativity, and others (Baker et al. 2003).

Most of the language material was excerpted from the Bulgarian National Corpus (Koeva et al. 2012), created at the Institute of Bulgarian Language "Prof. Lubomir Andreychin" in cooperation between the Department of Computational Linguistics and the Lexicology and Lexicography Department. The Bulgarian National Corpus consists of a monolingual part, which contains 240,000 texts or 1.2 billion words, and 47 parallel corpora.

The total volume of the dissertation is 379 pages, which includes 280 pages of main text and 98 pages of appendices. It contains an introduction, four chapters, conclusions, guidelines for future work, contributions and 2 appendices. The bibliographical sources are 147. The dissertation contains 38 table summaries and 4 figures.

Chapter 2

Meaning and automatic word sense disambiguation

2.1. Meaning and ambiguity

Meaning

According to I. Kutsarov, "lexical meaning arises and is formed by the connection of an object with a certain phenomenon from the environment with the object that the word replaces, by its ability to name specific objects, actions and their properties and qualities, by its connection with a certain concept and in other words in the lexical system of the language. Through its lexical meaning, a word becomes a linguistic sign." (Kutsarov 1998: 135).

It is well known that the plan of expression and the plan of content of the linguistic sign are in asymmetric rather than regular relations. It objectively follows from this statement that a sign can express more than one content and one content can be expressed by more than one sign.

Ambiguity

The term *polysemy* is used in linguistics to describe a situation in which a word has two or more related senses. Regarding the senses of perception predicates, R. Nitsolova (2008) groups them as follows: verbs for real perception (*виждам, чувам, слушам*), for imaginary perception (*счу ми се, привида ми се*), metaphorical when it comes to a cognitive process (*Видах, че Иван не е подготвен за тази работа.*)

Let us consider several cases in which perceptive verbs are used not only to convey meanings related to the five types of physical perception (visual, auditory, tactile, olfactory and gustatory), but also to express meanings that go beyond the semantics of perception.

(1) *Ще се видим в кафенето.*

(2) *Намирихва ми на нещо гнило.*

(3) *Предвкушвам успеха.*

(4) *Книгата ме докосна.*

Such meanings can be developed in basic and derived verbs. The main question is why and in what way these verbs connect precisely defined semantic classes and how the transition from physical perception to the field of abstract use is carried out.

S. Schule speaks of 2 types of "seeing" - non-epistemic and epistemic (Schule 2000: 2). The naming of pure perception without a cognitive process is considered non-epistemic. By epistemic vision, the author names the act of perception, which involves a mental process. The epistemic type can be subdivided into having a direct visual object of perception and an indirect one. S. Schule claims that the same scheme is valid for verbs from the groups of *hear / feel* and to a lesser extent for *smell / taste*.

In the light of her work, each of the complements of the predicates of perception basically presents two possibilities for interpretation. One is a description of the physical perception of an object (5) or event (6).

(5) *Иван видя сестра си.*

(6) *Иван видя, че сестра му включи телевизора.*

Another possible interpretation of perceptive predicates, also called epistemic (Dretske 1969), conceptual (Bollinger 1974), indirect (Kirsner and Thompson 1976) or abstract (Mönich 1992), connects them with verbs for cognitive activity.

(7) *Иван видя, че са го измамил.*

S. Moiseeva describes the perception predicates as "the connecting link between reality and human thinking". According to her, every object of sensory perception is transformed and made meaningful through mental categories.

Polysemy and homonymy

Polysemy is often seen as an opposition to homonymy. Usually, polysemy is described as the same form that has developed several meanings, while homonymy - as two separate lexical units that semantically and unmotivatedly coincide in form. J. Lakoff describes the systematic connection of meanings in polysemy as the main difference between the two (Lakoff 1987: 316).

J. Lyons suggests interesting criteria for separating polysemy from homonymy:

1. Etymological information about the lexical unit.

According to this criterion, lexical units of the same origin are considered polysemous, while those derived from different linguistic items are considered homonymous.

2. Sense connectivity.

It is a question of linguistic intuition whether two senses are connected or not (Lyons 1977: 550-551) and it may not always give unambiguous results. Another disadvantage is that the concept of connectivity is largely a matter of degree.

Attempts to formalise the representation of connectivity have been made by J. Katz and J. Fodor (1963). They offer component analysis, with the help of which they decompose each meaning to its minimum distinctive features - [+/- human being] [+/- adult] [+/- male], etc. This leads to component definitions. They suggest polysemy exists in the presence of certain components.

Nadezhda Mihaylova-Stalyanova in her work "Verba percipiendi in Bulgarian and Polish" examines perceptive predicates with the help of the theory of component analysis (Mihaylova-Stalyanova 2011). The author describes the system of semantic components involved in the construction of the meaning of perceptive verbs, on the basis of which she establishes the semantic correspondence between the two languages. This research will be discussed later in Chapter 4.

E. Sweetser distinguishes metaphorical attribution of cognitive meanings in the class of perceptive verbs. The author sees the mutual penetration of the semantics of physical and mental activity as the main influence in the historical development of polysemy (Sweetser 1990).

In most polysemy studies, 2 main problems arise:

1. The separation of homonymy from polysemy, i.e. establishing the boundaries in which we speak about separate senses of the same word and differentiating the cases in which different senses are observed, expressed with matching strings.

2. Distinguishing polysemy from monosemy, i.e. establishing the extent to which the difference in the specific use of words can be considered as contextual variation within one sense in contrast to the cases in which a use of the word should be described as the realisation of another sense.

It is important to emphasise at the very beginning that the automatic word sense disambiguation does not face the traditional problem of distinguishing homonymy from polysemy. It is necessary to find a way to describe and distinguish each of the semantic uses, regardless of whether different senses are observed within a word or within different words with the same spelling and pronunciation.

Thus, for the purposes of the research, when disambiguating, the phenomena that represent the graphic designations with more than one different semantic content are considered as ambiguous. In the case of asymmetric relations between a sign and a content, in which the same sign realises different contents, we will talk about ambiguity.

2.2. Automatic word sense disambiguation

The automatic word sense disambiguation is the process of choosing an adequate sense for a word in context from a set of predefined possibilities (lexical units).

The systems for automatic word sense disambiguation process the entry information in order to determine the correct sense with which each word is used in a given context. The text, composed of unlimited, freely used sentences, is entered for processing. Each of the words (or a selected subset of them) is assigned the same number of senses as listed in the specific vocabulary or a resource. The task of the algorithms is to determine the sense that is used in the example. There are many different approaches to word sense disambiguation. At the basis of each of them lies a different type and amount of information. That is why the obtained results differ both in the percentage coverage of the words from a given text and in the correctly defined words as to their semantics.

Criteria for defining senses

There are various criteria for sense differentiation. They can be divided into three groups - paradigmatic, syntagmatic and conceptual. Different lexicographers work with different types of criteria or combine several of them. As this type of information is also used in algorithms to disambiguate senses, the different groups will be described in detail.

Paradigmatic criteria:

1. Grammatical-paradigmatic - differences in paradigmatics contribute both to the resolution of grammatical ambiguity and to the elimination of the semantic one. Differentiating parts of speech or paradigmatic patterns of words that graphically coincide in one of their forms facilitates the process of disambiguation (*Тя прави бели всеки ден. Иван бели картофи.*) and can be useful, but only when using a dictionary with not very granulated senses.

2. Semantic-paradigmatic - within the paradigmatic criteria related to semantics, we can consider the well-known Kurilovich-Smirnitsky principle, according to which different uses of a word are considered separate senses if they have different lexical-semantic relations (*студена кухня – топла кухня; студен ден – горещ ден*).

Syntagmatic criteria:

Proponents of this approach assume that each of the different senses of a word is combined in a unique way with other words in syntagms, which is embedded in the idea of the valence structure of senses. Used alone, these criteria do not always give unambiguous results. The research shows that for Bulgarian language the use of this type of information only would not lead to an adequate word sense disambiguation.

Conceptual criteria:

This type of grounds for separating one sense from another refers to the knowledge of native speakers about the similarities and differences of concepts, as well as of their corresponding denotata. Until recently, it was thought that the main problem with conceptual criteria was that they could not be formalised. As part of the cognitive approach to language research, new methods have been developed in recent decades to give theoretical status to conceptual criteria. Namely, with the help of

the metalanguage apparatus of the so-called frames or ontologies, conceptual structures behind linguistic expressions can be described and subsequently these descriptions can be integrated into linguistic systems.

2.2.2. An overview of the approaches used in the automatic word sense disambiguation

When talking about the different approaches in word sense disambiguation, we need to explain that they are rarely limited to the use of only one type of information - syntagmatic, paradigmatic or conceptual. Newer and upgraded approaches most often combine different types of information and statistics.

Approaches, involving syntagmatic and statistical information

In syntagmatic-based systems, corpora are usually used to disambiguate words. Such are the approaches of H. Ng and H. Lee (1996), Chai and Birman (1997, 1999), P. Hawkins, who proposes to use both **frequency and contextual information** (Hawkins 1999).

Approaches, involving conceptual and statistical information

Well-known approaches that use these types of information are those of R. Bruce and L. Guthrie (1992), M. Stevenson and J. Wilks, who worked on Longman (Stevenson, Wilks 1997) and R. Mihalcea and D. Moldovan, who suggested a new WSD approach - **Bootstrapping** (Mihalcea, Moldovan 2001). The algorithm is iterative and follows several steps of manual annotation and data retrieval from corpora.

Approaches, involving paradigmatic, syntagmatic and conceptual information

This group includes M. Lesk's approach, which proposes a method for word sense disambiguation, using **vocabulary definitions** of words to detect the semantic similarity and overlapping of words from the definitions with words from the contextual environment (Lesk 1986). P. Resnik uses **Wordnet, surface-level parsing and selective constraints** (subcategorization frames) (Resnik 1997). Y. Wang et al. offer a very sophisticated and multi-component model for capturing semantic ambiguity, which works in four steps: **semantic space exploration, relation extraction, similarity calculation and semantic path exploration** to find maximum similarity (Wang et al. 2020). C. Baker and C. Fellbaum suggest the use of combined information from Wordnet and Framenet for annotation (Baker and Fellbaum 2009). E. Laparra and G. Rigau present an algorithm for word sense disambiguation, relying on both resources (Laparra and Rigau 2009). They apply the predicate-argument level of the Framenet to Wordnet units, identifying the typical participants in a given situation.

In 2019, K. Orkphol and Wu Yang proposed a model in which they used Wordnet as their main resource and explored the information using **vector probabilities** derived from Wordnet definitions and relations and the sentences themselves. The method works iteratively for the rest of the context (Orkphol and Yang 2019).

Most authors of various systems draw attention to the fact that building sufficiently rich predicate models for semantic processing requires the manual efforts of large teams of researchers. In

their work on Wordnet and Framenet and their use in the processing of natural language A. Burchardt et al. (2005: 3) note that the two main problems that arise are related to the correct attribution of frames to predicates and, accordingly, to the semantic roles of the main constituents in the sentence. K. Erk believes that the correct attribution of frames in fact does solve the WSD problem (Erk 2005).

After the analysis of different types of information that these approaches use, one of the goals of the research will be the selection of the most appropriate combination of linguistic data that will lead to correct automatic word sense disambiguation of perception verbs in Bulgarian. We believe that this set of linguistic tools is sufficient for its effective carrying out.

Chapter 3

Semantico-grammatical predicate classifications

3. Predicates and classifications

A classification of predicates is a special case of a linguistic classification. Many authors have tried to present an unambiguous and comprehensive semantic classification of predicates for different languages (Z. Vendler 1967, L. Shcherba 1974, W. Chafe 1975, J. Lyons 1977, O. Seliverstova 1982, B. Levin 1993, Y. Apresyan 1995, R. Van Valin and R. LaPolla 1997 and many others). As O. Seliverstova notes, there is still no generally accepted semantic classification of predicates in linguistic literature based on a certain number of differential semantic components.

We could say that classifications are divided into two major groups: semantic and aspectual. The former is characterised by the division of verbs into semantic classes (verbs of movement, speech, perception, knowledge, emotion, physical impact, expression of will, etc.). This type of verb description often uses semantic decomposition. The second group can be called grammatically oriented semantic classifications, which consider verbs mainly in terms of their aspectual characteristics. According to E. Paducheva (2009) the semantic and categorical classifications are largely independent. Hence, verbs of the semantic class of perception can be represented by all Vendler's classes: states (*виждам*), activities (*разглеждам [стисание]*), achievements (*видя*), accomplishments (*наблюдавам*).

The empirical material analysed in the research proves that distinct senses represented by the same graphic word can also belong to different aspectual classes.

(1) *Розата мирише*. (state)

(2) *Той мирише розата*. (activity)

That is why the central object of the research is the individual sense of a graphic word, and not its set of meanings.

3.1. Semantic classifications

J. Trier's views on the semantic field in linguistics (Trier 1931) are summarised, as well as **B. Levin's** - based on the correlation between the semantics of verbs and their syntactic functions (Levin

1993). We can point out the experiments in this field in the Bulgarian lexicographic tradition by **I. Kasabov** (1990) and others. In Wordnet, predicates are also divided into semantic classes (Miller 1995, for BulNet - Koeva et al. 2016), called semantic primitives, such as verbs of perception, mental activity, body care, social relations, etc. Based on the semantic information, the verbs are divided into 15 classes, including the analysed perceptive verbs (verb.perception) and verbs naming mental states and activities (verb.cognition).

3.2. Classifications and aspectuality

On the other hand, there are many typologies based on the aspectual classes of Z. Vendler (Z. Vendler 1967, D. Dowty 1979, T. Buligina 1982, E. Paducheva 1996, R. Van Valin and R. LaPolla 1997). Many of them involve the achievements of previous taxonomic studies, and in many cases similar classifications have been developed in parallel. Therefore, a significant problem within this type of description is the terminological apparatus and the range of verb groups. We will give a brief overview of the existing taxonomies, which to a certain degree have affected the present work.

L. Shcherba defines three types of predicates, characteristic for the Russian language - with the meaning of activity, state and quality (Shcherba 1974: 90). **Z. Vendler** divides all verbs, or rather, verb senses into activity terms, accomplishment terms, achievement terms and states (Vendler 1967). Many authors rely on the classes of Z. Vendler and elaborate them.

According to J. Lakoff, a semantic classification of predicates should be related to features based on semantic components that have grammatical relevance, i.e. those that are essential not for individual lexical units but for whole classes. In other words, each of the classes has to be a meaning class with certain semantic features capable of affecting the syntactic rules (Lakoff 1987: 165).

Within the generative grammar J. Lakoff formalises the relation between static, inchoative, and causative predicates. As S. Leseva notes, "the deep structure of lexical inchoatives and causatives contains abstract predicates with a specific feature, respectively (+INCHOATIVE) and (+CAUSATIVE), which in paraphrases is expressed with the corresponding lexical verbs *become* and *make / cause*" (Leseva 2012:48). These logical structures are inherited in a number of formal models such as the Grammar of Role and Reference (Van Valin and LaPolla 1997: 102), the event structures of B. Levin and M. Rappaport-Hovav (2005) and others.

D. Dowty elaborated Vendler's classification by dividing achievements and accomplishments by the agentivity / non-agentivity feature (Dowty 1979). He noted that many of the criteria that Vendler points out are more or less related to agentivity, control, animacy, or other agent or quasi-agent entities, often without drawing a line between agentivity and aspect.

R. Van Valin and **R. LaPolla** describe the states of affairs that outline the types of extralinguistic phenomena. They refer to the Aristotle tradition and distinguish 4 types of states of affairs:

1. situations – static, non-dynamic states of affairs, which may involve the location, condition, position or inner experience of a participant;
2. events – states of affairs seem to happen instantly;
3. processes – states of affairs that take place over time and involve a change in the state, situation or inner experience of a participant;
4. actions – dynamic states of affairs in which a participant does something.

In addition to these four classes of spontaneous types of verbs, R. Van Valin and R. LaPolla provide causal equivalents to all of them. Later the authors added to them active accomplishments and semelfactives.

3.3. Specific classifications covering predicates of perception

Most studies on perceptive verbs use thematic classifications by sense modality. The research of A. Viberg, S. Schule, K. Horie, B. Antunano, N. Mihailova-Stalyanova and others are organised in this way. Some research focuses on a certain type of perception. R. Nitsolova (1992) considers particular verbs for auditory perception, E. Pernishka (1977) - for visual perception. Some studies include a type of perception and an additional aspect through which the predicates are viewed. S. Koeva (1998) studies perception predicates and the syntactic realisation of their arguments.

Let us focus on some authors who present classifications of perceptive predicates, often using both semantic and aspectual information.

A. Viberg presents in his research from 1983, and in his later works (2001, 2019) a very detailed typology of perception predicates.

In his earlier research, he divided the verbs into two main types: Experiencer-oriented verbs and Stimulus-oriented verbs ("phenomenon", in his terminology). The Experiencer-oriented group was further subdivided into active and passive verbs for perception. Thus for each type of perception the triad active (*look at*) - passive (*see*) - copulative (*look*) predicate is obtained (the terminology used is by A. Viberg). The author indicates such types for the five perception modalities. In his later research (e.g. 2019) he included several additional components: neutral perception, sensory copulas, perceptibility verbs, sensory verbs. In this way the following typology of predicates was formed:

	Experiencer-oriented		Phenomenon-oriented		
Sense modality	Activity	Experience	Sensory copulas	Perceptibility verbs	Sensory verbs
Neutral	examine 'изследвам'	perceive, notice 'улавям, забелязвам'	seem 'изглеждам'	be noticeable 'забележим съм'	
Sight	look at 'гледам'	see 'виждам'	look	be visible	shine

			‘изглеждам’	‘видим съм’	‘светя’ shimmer ‘блещукам’ glimmer ‘мъждукам’
Hearing	listen to ‘слушам’	hear ‘чувам’	sound ‘звуча’	be audible ‘доловим съм’	crack ‘пуквам’ creak ‘скърцам’ sough ‘фуча’ buzz ‘жужа’
Touch	feel touch ‘докосвам’	feel ‘усещам’	feel ‘усещам се’		tickle ‘гъделичкам’ abrade ‘жуля’ tingle ‘смъдя’ sting ‘жиля’ burn ‘паря’
Taste	taste ‘опитвам’	taste ‘вкусявам, усещам’	taste ‘има вкус’		
Smell	smell (at) ‘душа’	smell ‘мириша’	smell ‘мириша’		stink ‘воня’

Table 1. Typology of A. Viberg (2019:19)

Leech / Paducheva classification

E. Paducheva largely follows the classification of **J. Leech**, disagreeing with the terminology concerning one of the types.

The unified categorical paradigm of English basic perception verbs is described by J. Leech (Leech 1971/1975: 19-23). This is a thematic class of verbs that can be described with the help of a categorical paradigm. It can be considered not as purely categorical, but categorically-diathesis (the change of the category can be conditioned by the change of the diathesis). The five main verbs for perception in English (*see, hear, feel, smell, taste*) demonstrate in addition to their basic sense two derivatives, which in some of them are expressed by semantic derivation (*feel, smell, taste*), and in other cases - through different words (*see and look at; hear and sound*).

In its first sense, the verb describes a situation in which a subject experiences some perception involuntarily, while in the second "the perceiver focuses his attention on an object" (Leech 1975: 23). The third type is a diathesis with Experiencer "behind the scenes" (E. Paducheva / according to Leech 1975, "passive state") (*You look tired*).

In Bulgarian language this paradigm has a conceptual character for some of the types of perception, i.e. all cells are filled with different words (e.g. *виждам, гледам* and *изглеждам*).

The main 2 features that are essential for S. Moiseeva's description are active / passive perception and the participant's subject / object position (Moiseeva 2005). On this basis, she divides predicate relations into 4 main groups:

1. Verbs for subject-passive perception:
 - 1a. Possession of perceptual ability: *виждам, чувам*.
 - 1b. Loss of perceptual ability: *ослепявам (ослепя), оглушавам*.
 - 1c. Causation of the loss of perceptual ability, i.e. depriving someone of their ability to perceive: *ослепявам (ослепя)*.
 - 1d. Acquisition of perceptual ability: *проглеждам, прочувам*.
2. Verbs for subject-active perception. Use of perceptual ability. This group involves the active perception of the subject: *възприемам*.
 - 2a. Active use of perceptual ability: *гледам, слушам*.
 - 2b. Active non-use of perceptual ability: *отмествам поглед*.
3. Verbs for object-passive perception: the property of objects to affect the organs of human perception when the state of the object is in the field of view of the subject: *възприемам се*.
 - 3a. The object possesses the property to affect the organs of perception: *блестя, звъня, мириша, вкусен съм, гладък съм*.
 - 3b. Deprivation of the object of the ability to affect the organs of perception, i.e. causation of non-impact: *крива*.
4. Verbs for object-active perception, influence on the subject's organs of perception by entering the active zone of perception.
 - 4a. Causation of the object's impact on the organs of perception, i.e. creating in the object a property to influence the organs of perception: *появявам се, излъсквам*.
 - 4b. Unrealized property of the object to affect the organs of perception: *изчезвам*.

The author notes that verbs are traditionally divided into actions and states and active and non-active. The non-active ones are subdivided into static (naming situations) and dynamic verbs, meaning processes and events, and the active verbs are divided into process- and event- verbs. She considers separately the semantically transitive (agentive) verbs in which the action is directed at the object (*Той гледа филм*).

3.4. Features that will be used in the description

The features that are relevant for the class of verbs considered were derived, based on the classifications discussed in section 3.3.

Topicality / non-topicality

An important part of the description of predicates are the features constancy - short duration - indefinitely repetitive actions. In this case we are talking not about the aspectual-temporal relations, but about the semantic potential of the predicate, i.e. the ability of verbs to refer to one or another temporal option that characterises different semantic classes. It is known that there are predicates that can only describe a current situation (*ставам*) and those which, on the contrary, do not presuppose topical usage (*обичам*).

(3) *Той вижда.* (general)

(4) *Той вижда книгата.* (topical)

Subject / Stimulus orientation

As noted in the review of classifications, a number of authors draw attention to the presence and active participation of the subject in the realisation of predicates or their individual senses. Based on this principle, the verbs of perception are divided into two main classes - those of Subject-oriented and Stimulus-oriented predicates. The first class encodes the perceiver as a subject at the sentence level (see example 5), while the second selects the Stimulus as an external argument (e.g. 6).

(5) *Мария видя книгата на масата.*

(6) *Луната изглежда пълна днес.*

In some cases, the same graphic word realises both classes within two senses. A typical example of this phenomenon is the verb *мириша* (see examples 7 and 8).

(7) *Том пазеше тайната и току миришеше свитъците.*

(8) *Косата ти мирише на лавандула и дъжд.*

Agentivity / non-agentivity

Many typologies pay attention to the agentivity / non-agentivity feature. Sometimes the statives are differentiated from the non-stative verbs on this basis (for example, Lyons 1977, 483), and in some studies it has been proposed to distinguish a specific category of activity / inactivity (Viberg 1983). E. Paducheva (2004) divides them on this basis into inert states (*see, hear*) and actions (*watch, listen*). The second group presupposes active and volitional directing of the attention of the perceiver or his sensory organs towards the Stimulus.

Causativity / non-causativity

Perceptive verbs are a unique class in terms of the relation between the roles of participants and their syntactic exponents. Transitional verbs are usually action verbs, and the semantics of action presuppose causation. The verbs of perception, although transitive, either do not manifest the meaning of action at all, or (as with *забелязвам*) it appears secondary. In the basic items of the perception class (*Иван видя стола / забеляза заека*) the main causation is directed conversely – from the Object-Stimulus towards the Experiencer.

Chapter 4

Semantic characteristics of the perceptive verbs

4.1. Perception predicates

The term *perception*, considered in linguistics, is borrowed from philosophy and psychology.

In modern psychology, perception is understood as a perceptual system in which the interacting components are the subject and the object of perception. The individual who perceives (observer, listener, etc.) is accepted as the subject of perception and the reality - as the object of perception (Barabanshchikov 2006).

Verbs of perception have been the subject of numerous studies in various linguistic fields. B. Heine et al. (1991) studied grammaticalization, K. Horie (1993) - complementation, E. Sweetser (1990) - semantic changes. S. Schule (2000) studies the complements of perceptive verbs in Akatek (language of the Maya family - Guatemala), S. Moiseeva (2005) makes a comparative analysis of the semantic field of perception verbs in Romance languages, B. Antunano (2000) considers them from the point of view of metaphor in polysemy. In Bulgarian linguistics, perceptive predicates have been researched by R. Nitsolova (1992), S. Koeva (1998, 2004), K. Aleksova and Y. Tisheva (2000), L. Laskova (2010), E. Tarpomanova (2020) and others. E. Pernishka (1977) considers the formal and semantic parallels between the Bulgarian and Polish verbs for visual perception. She pays attention to the expression of mental activity with the help of visual perception verbs. N. Mihailova-Stalyanova (2011) describes them with the help of the theory of component analysis in comparative terms with their Polish correspondences.

4.2. Selection and conventions

473 synsets marked with a primitive perceptive verb (verb.perception) were excerpted from Wordnet. Of these, 131 synsets remained outside the scope of the study, as they were represented by literals only in the Princeton Wordnet. As a result of this filtering, 342 synsets containing 1253 literals, presented in Bulgarian, have been profoundly studied and described. Their semantic scope, the realisation in different contexts and the systematic features, which characterise the representatives of this group, have been analysed. The main part of the language material has been compared with the Dictionary of Bulgarian language and the senses of the considered predicates presented in it.

4.3. Analysis of the semantic class of perception verbs

As the verbs of perception reflect the relation between physiological perception and language, the main microfields or subclasses, into which these verbs are divided, are related to the five types of sensory perception - visual, auditory, tactile, olfactory and gustatory.

According to the above semantic criterion (based on the microfield-specific semantic components), these verbs can be distributed as follows:

- verbs of visual perception (*гледам, виждам, наблюдавам*);

- verbs of auditory perception (*слушам, чувам*);
- verbs of tactile perception (*усещам, докосвам*);
- verbs of gustatory perception (*вкусам*);
- verbs of olfactory perception (*подушвам*).

In addition to these almost intuitive groups, there are criteria for a more precise classification. As early as 1949, S. Buck divided verbs of perception into subject and object types (Buck 1949).

The choice of a certain grammatical subject is fundamental as to the grouping of this class of verbs, as it gives preference to the perceiver or the object of perception and allows to distinguish between Subject-oriented perceptive verbs, on the one hand, and Stimulus-oriented perceptive verbs - on the other. The verbs oriented to the perceiver differ from the verbs oriented to the perceived in that the former take as an external argument animate beings who undergo an experience, while the representatives of the second type take the perceived unit as a sentential subject. The first group will also be called subject-oriented (Experiencer-oriented, Experiencer-subject) predicates, and the second - object-oriented (Stimulus-oriented, Stimulus-subject) predicates.

Subject-oriented verbs	Stimulus-oriented verbs
Виждам <i>Видях човека.</i>	Изглеждам <i>Човекът изглеждаше весел.</i>
Чувам <i>Чувам песните на птиците.</i>	Звуча <i>Птиците звучат по-приятно там.</i>
Усещам <i>Усети топлината на завивките.</i>	Усещам се / на допир съм <i>Усеца се вълната в материята. Пуловерът беше мек на допир.</i>
Мириша <i>Обича да мирише суната.</i>	Мириша <i>Ястието миришеше превъзходно.</i>
Вкусам <i>С нетърпение вкуси от сладоледа.</i>	Имам вкус / лютя / сладня... <i>Ей, че люти тази чушка!</i>

Table 2. Division of perception verbs in Bulgarian language according to their orientation towards the perceiver or the perceived.

As can be seen from the table, the verbs of perception in Bulgarian are also subject to this division. On the one hand, there are verbs that select the Stimulus as an external argument. On the other hand, there are verbs that select the Experiencer as a verbal subject, and are usually transitive. Perceiver-oriented predicates, in turn, are subdivided into **spontaneous** (for condition - Z. Vendler (1967), cognitive - A. Rogers (1971: 206), experiencer - A. Viberg (1983: 123), passive - F. Palmer 1966: 99), stative with Experiencer subject - A. Lehrer (1990: 223), inert states - E. Paducheva (2004: 204) and **intentional** (active - A. Viberg (1983: 123), active perceptive verbs - J. Leech (1971: 23), A.

Rogers (1971: 206), active with Experiencer subject - A. Lehrer (1990: 223), actions - E. Paducheva (2004: 204), i.e. those that are intentionally directed. Spontaneous predicates can be used non-transitively and non-topically to signify physical ability to perceive.

The five types of perception verbs and the three types of grammatico-semantic classification define a matrix of 15 cells. A. Viberg believes that there are ways to express these 15 meanings in all languages, although in some languages it is largely a matter of polysemy and not of different words. He also talks about universal hierarchies concerning the expressed modalities through lexicalization and polysemy.

A. Viberg's typological research shows that there is a hierarchy of lexicalization of the five sensory perceptions, as shown in (1).

(1) Sight > Hearing > Touch > Smell, Taste.

The schematic representation of the hierarchy shows that if a language lexicalizes only one verb for inactive perception, it will be for visual perception; if it lexicalizes two of them, they will most probably be for visual and auditory perception, etc. The leadership of the sight and hearing verbs has made an impression on a number of linguists. According to N. Arutyunova, perceptive verbs, and above all the verbs *see* and *hear*, fight for supremacy in the hierarchy, as well as for the spheres of influence (Arutyunova 1998: 416). Olfactory and gustatory perception do not show a clear order of lexicalization in different languages and are sometimes lexicalized as a single verb. Therefore, they are separated by a comma in (1).

By means of analysis of the semantic structure of perception predicates, the following general features have been distinguished: possession of the ability for sensory perception, constant functioning of the ability, acquisition of perceptual ability and causation of perceptual ability. As S. Moiseeva (2005) points out, it is possible to identify the archetypes of *state* and *action* with the respective differential components: for states - their resultativity, for actions - the volition involved. The author defines the ability to perceive as an unfocused process (*виждам, чувам, усещам*), whereas, according to her, verbs possessing the component *use the ability to perceive* demonstrate a volitional process (*гледам, слушам, пробвам, докосвам*). She notes that the second group marks action, as it involves the components "will" and "intention" (A. Peshkovskij 1956: 79).

Many other authors point out that the subject-oriented verbs are also related to the division of intentional and unintentional (according to various terminologies also called agentive / non-agentive, volitional / non-volitional, etc.). E. Pernishka characterises them as oppositional pairs (*гледам – виждам*) divided by the features of conscious - unconscious perception. In this way, an intragroup division within the subject-oriented perception verbs is obtained.

Thus, the semantic components characterising perceptive verbs, i.e. those that define a verb by the type of sensory perception, interact with several components independent of the semantic class - agentivity / non-agentivity and copulativity (Viberg 1983).

- (2) *Иван слуша музика.* – volitional / agentive subject-oriented predicate;
- (3) *Иван чу птиците.* – non-volitional / spontaneous subject-oriented predicate;
- (4) *Иван звучи добре.* – stimulus-oriented predicate (copulative, according to A. Viberg).

The first group of predicates is presented in the following examples (5-9), illustrating verbs of all types of sensory perception, positively marked with the component of agentivity (activity / intention / control):

- (5) *Иван погледна котката.*
- (6) *Иван слушаше песента.*
- (7) *Иван докосна котката.*
- (8) *Иван подуши парфюма.*
- (9) *Иван опита супата.*

The representatives of this subgroup are also called “active perceptive verbs” (Leech 1971:23), “active verbs with Experiencer subject” (Lehrer 1990:223), “actions” (Paducheva 2004:204) or simply “active” (Viberg 1983:123). They all name an action that is consciously controlled by an agent (animate, most often a human being).

The second group traditionally expresses a certain perception, which takes place independently of the will of the perceiver (10-14).

- (10) *Иван видя котката.*
- (11) *Иван чу песента.*
- (12) *Иван усети трънчето.*
- (13) *Иван надуши дима.*
- (14) *Иван усети чесъна в лютивката.*

The examples from the second group represent all types of sensory perception in which the subject does not control the activity, the organs of perception or the stimulus. For this reason, the representatives of this subgroup are often called “passive perception verbs” (Palmer 1966:99), “inert perception verbs” (Leech 1971:23), “stative with Experiencer subject” (Lehrer 1990: 223), “inert states” (Paducheva 2004:204) “experiencer verbs” (Viberg 1983:123).

The third subgroup is formed by verbs for the five modalities, whose subject is the Stimulus of perception (15-19).

- (15) *Иван изглеждаше щастлив.*
- (16) *Иван звучеше щастлив.*
- (17) *Копривата го пареше.*
- (18) *Иван миришеше на цигари.*
- (19) *Ястието имаше вкус на чесън / лютеше.*

This subgroup has also been given various terms - “with Stimulus subject” (Lehrer 1990:223), “copulative” (Viberg 1983:123), “percepts” (Gisborne 1996:1), “with Experiencer behind the scenes” (Paducheva 2004:204).

The authors approach the groups diversely in terms of terminology. In the present study, we use the term "subject-oriented" in relation to active and Experiencer predicates and "stimulus-oriented" when referring to the last group.

The semantic class of perception verbs exists as an organised hierarchical structure. It connects the five microfields, each being dominated by a semantically most common hyperonym associated with direct or sequentially related (transitive) hyponyms. Hyperonyms are connected both vertically (with their hyponyms) and horizontally with each other, representing the whole system of perception. The considered semantic class is interstructurally organised on the one hand, but there is also an intersection with certain parts of other classes, characteristic for the whole language system. Therefore, our research interest is focused on the comprehensive description of verbs for perception, taken in unity with the sphere of cognitive activities. The starting point for the study are perception verbs, but the goals we set include tracking the extension of meanings into the field of cognition.

Using all the semantic and grammatical components considered so far, the following typological lattice can be constructed:

Classification

Modalities	Subject-oriented perception verbs		Stimulus-oriented perception verbs
	Agentive	Spontaneous	
Visual	<i>Гледам</i>	<i>Виждам</i>	<i>Изглеждам</i>
Auditory	<i>Слушам</i>	<i>Чувам</i>	<i>Звуча</i>
Tactile	<i>Докосвам / Пипам</i>	<i>Усецам / Чувствам</i>	<i>Усецам се / На допир съм</i>
Olfactory	<i>Мириша</i>	<i>Надушвам</i>	<i>Мириша</i>
Gustatory	<i>Вкусвам / Опитвам</i>	<i>Вкусвам / Усецам</i>	<i>Имам вкус</i>

Table 3. Canonical perception verbs in Bulgarian language.

Our observations show that perceptive expressions related to visual perception demonstrate a significantly greater morphological, syntactic and semantic diversity than verbs of other modalities. Constructions with verbs of auditory perception largely echo the pattern of those for visual perception,

while expressions with verbs for tactile, olfactory and gustatory perception follow it in a much more limited way. The same statement is valid for the realisation of perceptive senses of different modalities within meanings of other semantic classes, through affixation and word formation. Verbs for visual perception also demonstrate the richest diversity in the ontological structure.

4.4. Perception predicates' senses

The senses of the perceptive predicates in Bulgarian language will be presented in two large groups: prototypical and non-prototypical senses. We refer to senses in which a kind of sensory perception dominates as prototypes. The non-prototypes include all representatives which syncretically realise the meaning of sensory perception and some feature of another semantic class (cognitive, social, etc.)

Prototype senses

The considered 210 synonymous sets (i.e. senses) are divided into subclasses according to the different modalities as follows:

- Neutral / general perception – 33 synsets;
- Visual perception – 81 synsets;
- Auditory perception – 77 synsets;
- Tactile perception – 18 synsets;
- Gustatory perception – 2 synsets;
- Olfactory perception – 11 synsets.

The synsets are presented in the way they were created by the Department of Computational Linguistics, IBL, BAS. Illustrative examples are added if the synonymous set contains such. In the cases where the synset does not contain an example, but it is necessary to illustrate the description, examples from the Bulgarian National Corpus are excerpted, on a separate line and with numbering.

ACTIVE PERCEPTION PREDICATES

Active general / neutral perception predicates

Our observations show that senses related to the general perception in Bulgarian language can be distinguished. They are related to the verbs for tactile perception, on the one hand, and the verbs for naming emotions, on the other. Active predicates of general perception are represented by several semantic sets.

@СКЛ: **търся:5; диря:5** – ‘изследвам територия или място с цел да открия нещо’ – *Търсихме цял ден и накрая намерихме детето в гората.*

Active visual perception predicates

Among the most numerous ones, this group is represented by 45 synsets with a rich variety of senses and nuances.

@СКЛ: **съзерцавам:1** – ‘наблюдавам продължително и задълбочено’ – *Съзерцавам луната.*

Active auditory perception predicates

The group is represented by 7 synsets.

@СКЛ: **подслушвам:1; подслушам:1** – ‘слушам тайно, без знанието на говорещия’ – *Ревнивият мъж подслушваше разговорите на жена си.*

Active tactile perception predicates

Tactile perception is more widespread in non-agentive senses and is represented by only two synonymous sets in Bulnet, marked with a semantic primitive perceptive verb (verb.perception). Most of the similar senses belong to the group of contact verbs.

@СКЛ: **докосвам:1; докосна:1; пипам:2; пипна:1** – ‘възприемам усещания посредством докосване’ – *Хелън Келър общувала с физическия свят, като докосвала хората и предметите.*

Active gustatory perception predicates

This type of predicates is not found in the database with a semantic primitive (verb.perception), but, as noted, meanings with a semantic component of perception are found in the group of verbs of consumption (verb.consumption). As an example of this comes the synset:

@СКЛ: **вкусвам:1; вкуся:1; опитвам:2; опитам:2; пробвам:2; дегустирам:1; куся:1; кусвам:1; кусна:1** – ‘поемам малко количество храна или напитка, за да усетя вкуса им’ – *Опитай тези нови бисквити.*

Active olfactory perception predicates

Four synonymous sets fall into this group, e.g.:

@СКЛ: **душа:1; подушвам:1; подуша:1; помиришвам:1; помириша:1; вдъхвам:1; вдъхна:1; вдишвам:1; вдишам:1** – ‘съзнателно възприемам чрез обонянието си дадена миризма’ – *Вдъхни уханието.*

PASSIVE PERCEPTION PREDICATES

Passive general / neutral perception predicates

A significantly better developed group than that of the active predicates of general perception. We study them according to the division of the Princeton Wordnet within perceptive predicates, although some of them semantically point to the class of predicates of emotion. This subclass has a total of 17 synonymous sets.

@СКЛ: **получавам:24; получа:15; приемам:47; приема:30** – ‘възприемам слухова, зрителна или друга информация под дадена форма или чрез определен канал (по телефона, телеграфа, чрез радиото, телевизията и т.н.)’ – *Когато се фокусираш върху определен обект, очите получават информация и от страничните предмети и изображения.*

Passive visual perception predicates

This type of predicates, which realises the meaning of involuntary perception, is well developed in terms of visual perception. Such synsets are, for example:

@СКЛ: **виждам:11; видя:11; забелязвам:4; забележа:4** – ‘възприемам даден образ или ситуация чрез зрението си’ – *Забелязаха кралските войници да идват по моста.*

In this group we also note predicates that are on the border between active and passive perception and are able to name both (a total of 5 synonymous sets of this type), e.g.:

@СКЛ: **разграничавам:1; разгранича:1; отсявам:1; отсея:1** – ‘различавам, идентифицирам някого или нещо сред много други’;

Passive auditory perception predicates

The non-agentive type of auditory perception verbs is represented mainly in the basic synonymous sets for perception:

@СКЛ: **дочувам:1; дочуя:1; долавям:2; доловя:2; подочувам:1; подочуя:1** – ‘чувам нещо без знанието или въпреки нежеланието на говорещите’ – *Дочухме разговора на съседната маса.*

Passive tactile perception predicates

There are two examples of a synset of this type. The first could also be used for general perception:

@СКЛ: **усещам:3; чувствам:4; почувствам:4; усетя:4** – ‘получавам пасивно възприятие относно нещо или изпитвам ефекта на нещо върху себе си’ – *Тя усети неприязънта в гласа му.*

Passive gustatory perception predicates

Non-agent verbs of taste perception are often replaced by the verb of general perception - "feel" (*усещам лютивия вкус*).

Passive olfactory perception predicates

A typical representative of this group is the following synset:

@СКЛ: **надушвам:1; надуша:1; подушвам:2; подуша:2; помирисвам:2; помириша:2** – ‘разпознавам, откривам или долавям нещо чрез душене или по сравним или подобен начин’ – *Котката надуши рибата и веднага се домъкна.*

STIMULUS-ORIENTED PERCEPTION VERBS

Stimulus-oriented predicates of copulative type

Stimulus-oriented general / neutral perception predicates of copulative type

@СКЛ: **изглежда:1** – ‘съществува известна вероятност за нещо, може да се допусне, предположи нещо’ – *Изглежда, че времето в Калифорния е лошо.*

Stimulus-oriented visual perception predicates of copulative type

@СКЛ: **изглеждам:2** – ‘създавам определено впечатление или представа на външен вид или на пръв поглед’ – *Тя изглежда заспала.*

When a verb selects a phrase describing the physical or intellectual state of the object, it usually marks an assessment (*изглежда занемарен / непреклонен*), while an expression related to the emotional state of the individual expresses doubt concerning the external expression (*изглежда весел / щастлив*).

Stimulus-oriented auditory perception predicates of copulative type

Typical examples of this kind of perception are:

(20) *Тази музика звучи ободряващо.*

(21) *Зазвуча камбанен звън, който огласи началото на церемонията.*

The synonymous sets with which this subclass is represented in Bulnet are respectively:

@СКЛ: **звуча:1; прозвучавам:1; прозвуча:1** – ‘създавам определено впечатление при слухово (или сравнено с такова) възприятие’ – *Той промърмори нещо, което прозвуча като съгласие.*;

@СКЛ: **зазвучавам:1; зазвуча:1** – ‘започвам да издавам звук или шум, да произвеждам определено звуково впечатление’ – *Музиката зазвуча из цялата сграда.*;

Stimulus-oriented tactile perception predicates of copulative type

The following synset is presented in Bulnet: „@СКЛ: **усещам се:1; почувствам се:2; чувствам се:2; усетя се:1** – ‘изпитвам определено физическо, психическо или емоционално състояние’“, but not as a Stimulus-oriented predicate, as used in the example (22) and (23).

(22) *Морето се усеща по-студено от обявените 26 градуса.*

(23) *Температурата ще е 32, ще се усеща като 36 градуса.*

Very often the tactile copulative representative is replaced by the construction *на допир съм*.

(24) *И на допир китът беше странен — не мъхест, а люспест и ръбест.*

Stimulus-oriented gustatory perception predicates of copulative type

This type is presented in Bulnet, but the replacement with the construction *имам (...) вкус* is highly frequent for Bulgarian language.

@СКЛ: **имам вкус:1** – ‘предизвиквам някакво усещане върху вкусовите рецептори’;

Stimulus-oriented olfactory perception predicates of copulative type

This type exists in the Bulnet database in one of the senses of the verb *мириша*.

@СКЛ: **мириша:2** – ‘издавам, изпускам (характерен) мирис’ – *Супата мирише хубаво.*

Stimulus-oriented perceptibility predicates

This subclass is represented only by synsets in the field of general, visual and auditory perception. No specific synsets marking the perceptibility from the tactile, gustatory and olfactory groups were found.

Stimulus-oriented perceptibility predicates of general / neutral perception

@СКЛ: **възприемаем съм:1; осезаем съм:1** – ‘притежавам сетивно възприемаеми качества’;

Stimulus-oriented perceptibility predicates of visual perception

@СКЛ: **виждам се:2; видя се:2; лича:1; проличавам:1; пролича:1; лъсвам:2; лъсна:2** – ‘съм или ставам видим, забележим, проявявам се или започвам да се проявявам’ – *Ще се види мръсната страна.*;

(25) *Бременността личи ли ѝ вече?*

Stimulus-oriented perceptibility predicates of auditory perception

@СКЛ: **звуча:2; чувам се:1; чуя се:1** – ‘издавам определен звук или звуци или предизвиквам определено слухово впечатление’ – *звучи в тон „ла“*;

(26) *Звукът на сирената се чува слабо, но чудовището го възприема.*

Stimulus-oriented perceptibility predicates of tactile perception: 0

Stimulus-oriented perceptibility predicates of gustatory perception: 0

Stimulus-oriented perceptibility predicates of olfactory perception: 0

A. Viberg claims that for many languages predicates of this subtype are not conceptualised for touch, taste and smell modalities (Viberg 2012), but the empirical material shows that for Bulgarian they are often expressed by "усещам се". Examples (27-29) confirm the author's hierarchical theory that higher situated verbs can be used with the meaning of lower verbs when they are not conceptualised.

(27) *Дюшекът е такъв, че изобщо не се усеща.* – (tactile)

(28) *А и пясъкът хич не се усеща на вкус.* – (gustatory)

(29) *Заблуждавам ли се – подхвана Хюнон, озъртайки се нервно към модната разговорна тръба, – или тук се усеща някаква смрад?* – (olfactory)

Stimulus-oriented sensory verbs

Throughout this subtype there is a wide variety of verb conceptualization, especially in the subclasses of visual, auditory and tactile perception. Some of them describe a passive property (*сияя, ухаля*), while others mark the active realisation of the property (*скърцам, бия*). The latter are mainly predicates for auditory stimulus-oriented perception. This diversity of action characteristics will be of interest in subsequent studies.

Stimulus-oriented sensory verbs of general / neutral perception

According to A. Viberg, this group is not represented in the languages he has analysed. 4 synsets of this type were found in Bulgarian, for example:

@СКЛ: **отразявам:1; отразя:1; изразявам:5; изразя:5** – ‘представявам изява, демонстрация, индикация на нещо’ – *Тази постъпка отразява истинските му схващания.*

The connection between tactile, interoceptive and general-perception verbs has already been discussed. As can be seen from the representatives below, some synsets can refer to each of them in different situations. In order to distinguish the uses of general interoception and tactile perception, the explicit presence of the sensory organ in the sentence structure is important.

@СКЛ: **боли ме:2; имам болка:1; чувствам болка:1; усещам болка:1; усетя болка:1; боли:2** – ‘изпитвам неприятно, болезнено усещане, имам физическа болка’ – *Болеше ли те след катастрофата?*

@СКЛ: **убива ми:1** – ‘чувствам болка или неудобство, които не могат да се свържат с точно определена причина или източник’;

Stimulus-oriented sensory verbs of visual perception

18 synsets are representatives of this type. Action and state verbs are common, but there are also process predicates.

@СКЛ: **блестя:4; лъщя:1** – ‘изглеждам блестящ, отразявам ярка светлина, например както мокра повърхност’ – *Мокрото шосе лъщеше пред тях.*;

@СКЛ: **светя:4; сияя:2; блестя:3** – ‘изглеждам светъл, бистър и чист, особено за цвета на кожата или лицето’ – *Лицето ѝ светеше, когато излезе от сауната.*;

Stimulus-oriented sensory verbs of auditory perception

The most numerous group of this type is the one of auditory perception with 58 synsets that express this type of semantic content. They can be subdivided according to the types of activities, which mean:

@СКЛ: **издавам звук:1; издам звук:1; произвеждам звук:2; произвежда звук:2** – ‘издавам характерен или естествен звук’;

@СКЛ: **бибиткам:1; свирия:4** – ‘произвеждам или наподобявам силен придупредителен звук на клаксона на моторно превозно средство’ – *Клаксоните на такситата бибиткаха.*

Stimulus-oriented sensory verbs of tactile perception

The group has a total of 15 synsets, some of which are presented below:

@СКЛ: **пулсирам:4; туптя:5; тупкам:4** – ‘бия, свивам се и се отпускам ритмично или предизвиквам подобно усещане, често придружено с болка или дискомфорт’ – *Цялата ми ръка пулсираше .*

@СКЛ: **паря:2; опарвам:2; опаря:2; лютя:1; налютявам:1; налютя:1** – ‘предизвиквам остра болка или неприятно усещане (като) от ужилване, изгаряне с нещо горещо и под.’ – *Мечта, докато цигарата му го опари, и едва тогава се обърна на другата страна и сладко задряма.*

Stimulus-oriented sensory verbs of gustatory perception

A. Viberg notes that no predicates are observed in this group. We believe that for Bulgarian such are *лютя, сладня, киселея, горча, солenea*, although not represented in Wordnet. The possible parameters of the Stimulus are limited, but they fall into interesting semantic configurations, some of which are described below.

Multiple examples found in the BNC confirm this assertion. More frequent are the examples with *горча* and *лютя*, which develop additional non-prototype meanings, and less frequent - *сладня*, *киселея* and *солenea* (with fewer uses in the Bulgarian National Corpus).

The main usage of all verbs naming taste varieties is related to taste perception. This is evident from the numerous examples in the corpus (47-56):

(30) *В устата ми сладни и соленее, усещам се сита...*

(30) *Ти ядеш ли скакалци, Док? — Да. В Мексико съм ял. Много лютят.*

(31) *Дотогава венецът ти ще заздравее, а ще ти дам и едно лекарство, с което сутрин и вечер ще изплакваш устата си, колкото и да горчи и да люти.*

(32) *Вашиите киселеят ли, или са от сладките?*

(33) *Любовниците ти изменят и стареят, виното ти киселее, парите ти крадат, а когато вечер искаш да отдъхнеш във весел кръг, верните ти поданицы идат с гробовни лица.*

Лютя shows a large number of encounters in which it is also used as a general or tactile perception verb:

(34) *Пушекът вече започваше да ми люти.*

(35) *Още не бяха притихнали писъците на децата след клането, още не беше заглъхнал звънтежът на мечовете, още миришеше на изгоряло и димът продължаваше да навлиза в стаите и да люти, и василевсът вече се разпореждаше в крепостта.*

In a large number of cases, *лютия* is used transitively to name the cause of an emotional state.

(36) *Госпожа Евпраксия тихо приближи и дрънна сина си за ръкава. — Моля ти се, не ги люти... Потърни малко...*

Горча also has encounters with metaphorical use in the field of emotional states with basic meaning *frustration*.

(37) *Сир Давос, истината понякога горчи, дори за човек като лорд Станис.*

Stimulus-oriented sensory verbs of olfactory perception – 5 synsets belong to this group.

@СКЛ: **ухая:1; благоухая:1** – ‘мириша приятно, издавам аромат’ – *Тя ухаеше на топло мляко.*

In this section the main 15 canonical and 30 prototype meanings related to sensory perception were summarised.

Non-prototype senses of basic perception verbs

We will call non-prototype senses that predicates have developed secondarily and that are characteristic of other semantic fields.

Lexical derivation from perception verbs

There are two types of meaning extensions:

- The first type covers the transfer of meaning within the lexicalization hierarchy of sensory perception. In particular, spontaneous verbs that are positioned higher in the hierarchy can also convey meanings of lower ones, but not the other way around.
- The second type of semantic transfer refers to the semantic extension (mostly of non-agentive perceptive verbs) in the non-perceptive field, mostly in the direction of cognitive meanings. In this case, the tendency to expand also follows the lexicalization hierarchy of sensory perception.

L. Roque et al. outline the manifestations of the two types of extension of semantics in various languages from a cognitive-linguistic perspective, using the terms *intrafield* and *transfield* extension (Roque et al. 2018: 373-375).

Semantic extension within the hierarchy

In his early attempts at lexical typological generalisations, A. Viberg noted that one of the most impressive characteristics of perception verbs is their polysemy with respect to different types of modalities (Viberg 1983: 136). We have already observed Bulgarian language material, which reflects the potential possibility and tendency of the perception verbs to cover the meanings of those lower in the hierarchy. This extension of use may be achieved by polysemy or by similar verb constructions. According to A. Viberg, this phenomenon of ambiguity extends primarily to spontaneous verbs of perception and is rare in intentional or copulative verbs (Viberg 1983).

Extension from perception to mentality

S. Moiseeva substantiates the connection between the perceptive and mental verb classes, stating that "on the basis of sensory perception a person builds up judgments about the world through language, and at the same time perception is realised with the help of language" (Moiseeva 2005: 21). As R. Budagov notes in his research on the basic perception verb *feel*, its senses refers to two modes - that of perception and of thought, and between them "there has never been a great distance" (Budagov 1963: 180). The semantic structure of this verb is manifested in the whole class of perception from the point of view of the organisation of its characteristic features.

In his typological study, A. Viberg notes that the following variations of cognitive and what he calls social meaning can be derived from perceptive verbs. As cognitive he defines senses similar to *know, understand, think* and *suspect* and as social - those similar to *meet, obey* and *know*. Below in this chapter will be presented in detail the semantic extensions that were found in the analysis of synsets and examples from the Bulgarian National Corpus. In the following table we indicate those that are distinguished in the study of A. Viberg (Viberg 1983: 158), illustrating them with Bulgarian examples.

Type of perception	Cognition meaning	Social meaning
Visual	<u>Know, understand</u> <i>Виждам, че си добър човек.</i>	<u>Meet</u> <i>Ще се виждате ли със Симеон?</i>
Auditory	<u>Know, understand</u> <i>Чувам, че бил добър в знахарството.</i>	<u>Obey</u> <i>Казвах ти аз, ама не слушаш...</i>
Tactile	<u>Think, experience</u> <i>Усецаш ли накъде бия?</i>	<u>Know</u> <i>Усецам кога човек се опитва да ме преметне.</i>
Olfactory	<u>Suspect</u> <i>Мирише ми на нещо гнило. А аз винаги пръв надушвам опасностите.</i>	-
Gustatory	<u>Experience</u> <i>...винаги да се връщам и да вкусвам от юношеството си, дори когато съм стар и побелял...</i>	-

Table 4. Basic types of non-prototypical meanings.

L. Roque et al. also point to the development of semantic derivation in perception predicates, associatively grouping meanings around cognition, attention, socialising, locating, trying, and co-identification (Roque et al. 2018: 380).

In the course of the study the lexical senses of the perception verbs in the Dictionary of Bulgarian Language and Wordnet were comparatively analysed (see Appendix 2). The starting point of the work was:

- choosing of the main representative for the matrix from a lexical and grammatical point of view (15 verbs);

For this purpose, the graphic word, the first meaning of which is presented as sensory perception in the Dictionary of Bulgarian Language, is considered as the initial semantic base;

- for this reason, all synonymous sets that contain it are excerpted;
- the semantic primitives to which these synonymous sets belong are taken into consideration;
- all senses in the Dictionary of Bulgarian language are compared with all synsets that contain the considered graphic word, and an attempt is made to equate them with each other, as well as to establish similarities and differences in reflecting the semantic diversity of the predicate;
- the illustrative examples of each sense are compared;
- the grammatical features reflected in the two resources are matched.

The volume of work does not allow to include all used predicates. The results of the sense comparison of the core 15 verbs are presented in the dissertation (see Appendix 1).

After the tabular comparison of the meanings presented in the Dictionary of Bulgarian Language and Wordnet, a large number of non-prototypical meanings were derived. The predicates that extend their meaning into the field of mentality are mainly considered. For completeness' purpose, attention will be focused also on senses extending into other semantic classes.

In order to present the methodology used in the analysis of canonical verbs, we accept as non-prototypical meanings only those ones that have a different semantic primitive from a perception verb (verb.perception). The semantic primitives are presented according to the classification of the Princeton Wordnet, and the synsets - with their definitions in Bulnet (@CKJ). The three canonical verbs are mainly presented - Subject-oriented predicates for active and passive perception and Stimulus-oriented predicate.

Non-prototype senses of visual perception verbs

The first group includes meanings that link physical visual perception with intellectual or mental activity. This group includes meanings such as *understand* (38), *predict* (39), *imagine* (40), *think* (41) and others.

(38) *И виждат, че някои министри съвсем не стават за отредената им в кабинета роля.*

(39) *Отсега виждам какво ще стане, ако не се включиш.*

In these cases, the preliminary clarity is stated as to how events will unfold before they actually occur. There is often a time adverbial used in such expressions.

Imagine is another meaning in which the main role is played by the imagination, without any specific certainty that the events will take place in reality.

(40) *Инвеститорите виждат икономическите зони като инвестиционен рай, където производството е по-евтино.*

The next meanings within the group - *consider* or *think* - are based on variable statements, observations, conclusions.

(41) *Много хора я виждат като световен лидер.*

Another of the non-prototype meanings that this group realises is *find out*.

(42) *Трябва да видя как да го оправя.*

The second group of meanings connects visual perception with social relations. This group includes meanings such as *meet* (43), *visit* (44), *accept* (45), *get on badly* (47), *go out with* (46).

The meaning of *meet* usually implicitly contains the information not only that the two parties will see each other, but also that they have made a preliminary agreement about it.

(43) *Ще се видим в 7.*

Visit is a separate meaning within the group of social relations.

(44) *Когато беше в болницата, само тя дойде да те види.*

In rare cases, the meaning *accept* can be realised when the subject of the sentence is a doctor, lawyer, and others, to whom one goes for advice, examination, interview, etc.

(45) *Докторът ще ви види след малко.*

The meaning *go out with (have a relationship)* is used as a synonym to the reflexive verb *виждам се с*. A time indicator is often included.

(46) *Те се виждат от година и нещо.*

Another meaning with very limited use in terms of negation and imperfectivity is *get on badly*.

(47) *Двамата не могат да се гледат от години.*

The third group is related to reliability or confirmation.

Verbs from the group of visual perception also realise usages related to establishing a completely unknown fact or the presence of an object - *find out, check* (48).

(48) *Виж кой чука.*

It is also used to express a recommendation or incentive similar to *take care of, see to*.

(49) *Виж там да стане възможно най-бързо.*

Manifestation of an active attitude towards a person in need is marked by example (50) in the meaning of *take care*.

(50) *Гледаше брат си от съвсем невръстен.*

Another possible sense is *witness*.

(51) *Видяха, че подозренията им се потвърдиха.*

In it, the Experiencer is usually defined as a passive witness to the events, and not as a participant in them.

(52) *Видял е много нещастия в живота си.*

This sentence carries some ambiguity, as it can be a witness to both one's personal experiences or those of other people. The construction has developed another meaning - **have suffered**, especially when using a non-transitive phrase - *Тя много е видяла в живота си.*

The verbs for visual perception also realise the meaning **find, make a reference**.

(53) *Ако те вълнува темата, погледни тази статия.*

As the examples show, the characteristic non-prototypical meanings are realised by the subject-oriented predicates - active and passive. Therefore, we will consider the distribution of the two types by their meanings. Non-agentive predicates demonstrate a much wider semantic derivation. Stimulus-oriented predicates are difficult to be found with non-prototype meaning.

Meaning		Active predicates (гледам)	Passive predicates (виждам / видя)
Mentality	understand, realize	+	+
	predict	+	+
	imagine	+	+
	think, consider	+	+
	find out	+	+
Social	meet		+
	visit		+
	accept		+
	go out with		+
	get on badly	+	
Reliability and confirmation	find out, check	+	+
	take care, see to	+	+

	witness	(+)	+
	make a reference	+	+

Table 5. Non-prototype senses of the canonical visual perception verbs.

Non-prototype senses of auditory perception verbs

One of the most developed non-prototype meanings of verbs for auditory perception always involves *paying attention*.

(54) *Слушай какво ти казвам.*

In these examples, the speaker requires the listener's attention. In subsequent development of this meaning, which is realised in other types of contexts, apart from requiring attention, the speaker insists that what is communicated be accomplished. In these cases, the meaning is close to *obey* and allows the presence or absence of an object.

(55) *Казах ти да слушаш майка си.*

(56) *Казах ти да слушаш.*

There are expressions that also show such uses through figurative meanings (*злук съм за молбите им*).

The meaning of *being informed* is essential in the study of evidentiality. Auditory verbs provide two types of truthfulness of information, depending on its source of - whether it is primary or secondary.

(57) *Чух, че ще заминаваш за Австралия.*

Another semantic derivation is observed in the meaning *understand*.

(58) *Ако добре съм Ви чул, имате предвид, че ситуацията изисква точно такива действия.*

Although obsolete, there still exists usage of *чувам* as *raise*. It is noteworthy that while in visual perception such a meaning is realised through an active predicate, in auditory perception the passive is used, most likely due to the strong transfer of the active (*слушам*) in the field of obedience (*obey*).

(59) *Искаше да го види отчуван и женен, пък тогава – каквото ще да става.*

And the adjectival use (*чувано дете*) testifies to the existence of this meaning.

The reflexive form (*чувам се*) is usually related to communication with the help of technologies.

(60) *Чухме се по телефона.*

(61) *Редовно се чуваме по скайп.*

Meaning	Active predicates	Passive predicates
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	(слушам)	(чувам / чуя)
Pay attention	+	+
Obey	+	
Be informed	+	+
Understand		+
Raise		+
Get in touch, communicate		+

Table 6. Non-prototype senses of the canonical auditory perception verbs.

Non-prototype senses of tactile perception verbs

Although not as rich in terms of meaning as the verbs of visual and auditory perception, this group of verbs also marks a diverse lexical derivation towards other semantic classes.

One of the main meanings beyond perception semantics is to **take in food or drinks**.

(62) *Иван едва се докосна до виното.*

Essential in these examples is the object that the verbs select. The meaning of the argument in these cases indicates whether food or drinks are considered.

In example (62) the verb can be replaced by **вкусвам от**, whereas example (63) shows that used with a different argument, the verbs *докосвам* and *пипам* can also be interpreted as **committing an inappropriate act, breaking an order, stealing**.

(63) *Не съм ти докосвал парите.*

Another characteristic non-prototypical meaning is **contact and change**.

(64) *Кой ми е пипал дрехите?*

This example expresses not only physical contact, but also a change in the condition of the objects. In (64) it is stated that the objects are not in their proper places or as they were left. This meaning is close to **influence** and is observed in the metaphorical interpretation of verbs for tactile perception.

(65) *Тази молба ни докосна дълбоко.*

(66) *Иван докосна сърцето ѝ.*

Another possible meaning (see example (67)) is **achieve**.

(67) *Той се докосна до върха в своята кариера.*

The more complex metaphorical meaning offered by this group of verbs is **to deal with, affect**.

(68) *Не бих се докоснал до този бизнес / до тази тема на разговор.*

The last of the marked non-prototypical meanings of this group of verbs is *conclude, realise*. Only this meaning is represented by the non-agentive verb *чувствам*.

(69) *Чувствам, че нещо не е съвсем така, както казва.*

Meaning	Active predicates	Passive predicates (чувствам)
Take of	+ (докосвам / докосна)	
Commit an inappropriate act, steal	+ (докосвам / докосна) (пипам) (пипвам / пипна)	
Affect	+ (докосвам / докосна)	
Reach	+ (докосвам / докосна)	
Deal with	+ (докосвам / докосна)	
Conclude, realize		+
Contact and change	+ (пипам) (пипвам / пипна)	

Table 7. Non-prototype senses of the canonical tactile perception verbs.

Non-prototype senses of olfactory perception verbs

Leaving aside the prototype meaning, the first extended one we will point out is *tracking* something.

(70) *Кучето душееше земята в търсене на заека.*

This example illustrates a semantic extension that still involves the class of physical perception. The dog is physically sniffing the ground and is looking for the trail (i.e. the smell) left by the rabbit.

Apart from this extension, which is related to physical perception, the verbs of olfactory perception also show additional metaphorical meanings. One of them is *to feel something intuitively*, see example (71).

(71) *Гергана надушва неприятностите от километър.*

Olfactory verbs can also be used with the meaning of **investigate**.

(72) *Полицията пак души наоколо.*

Another possible meaning is **go off** and this is one of the rare cases in which a Stimulus-oriented predicate is registered with a non-prototype meaning.

(73) *Млякото мирише.*

The meaning of direct refusal is rather used phraseologically.

(74) *Няма и да помиришеш повишение.*

The meaning **predict** is close to **feel intuitively**.

Дъщеря му умееше да надушва какво предстои.

Meaning	Active predicates	Passive predicates
Track	+ (душа)	
Suspect		+ (надушвам / надуша)
Feel		+ (надушвам / надуша)
Investigate	+ (душа)	
Predict		+ (надушвам / надуша)

Table 8. Non-prototype senses of the canonical olfactory perception verbs.

Non-prototype senses of gustatory perception verbs

In the non-prototypical meanings of verbs for taste perception, the meaning of **experiencing** something stands out.

(75) *Той вкуси разочарованието от загубата.*

As a separate meaning can be mentioned **enjoy**.

(76) *Той вкуси (от) всички удоволствия, които животът му предлагаше.*

(77) *Когато вече започнаха да предвкусват загубата на противника, организаторите прекъснаха мача.*

Loss is negatively marked, so we distinguish it from the meaning **enjoy**. Example (77) shows that the meaning of **predict** is rather realised in these cases.

Meaning	Active predicate	Passive predicate
Experience	+ (<i>опитвам / опитам</i>) (<i>вкусвам / вкуся</i>)	+ (<i>усещам / усетя</i>)
Enjoy	+ (<i>опитвам / опитам</i>) (<i>вкусвам / вкуся</i>)	+ (<i>усещам / усетя</i>)
Predict		+ (<i>предвкусвам / предвкуся</i>) (<i>усещам / усетя</i>)

Table 9. Non-prototype senses of the canonical gustatory perception verbs.

In conclusion, we call prototypical the use of verbs with physical perceptive meaning. Their use with other meanings is called non-prototype. In this section, we examined the prototype meanings and major extensions of perception predicates in the semantics of other classes.

Chapter 5

Verb senses and arguments

Frames

In this part the frames typical for the Bulgarian predicates of perception will be presented, their frame elements will be analysed in terms of the semantic restrictions, the syntactic categories and functions they project, as well as the possible prepositions that introduce them. All presented frames will be related to the typology of perception verbs, which was outlined in Chapter 4.

Using the correlation of frames to synsets, we analysed the classes of verbs summarised in Chapter 4. Each frame is represented by the different senses and verbs that express them.

Below, the information about the frames with the corresponding number of representatives within the analysed synsets is illustrated in tabular form, as well as the types of perception, according to the classification in Chapter 4.

Frame elements and semantic restrictions

Since the main task in this section is to outline the selective restrictions, indicating the acceptable combinations of predicates represented by their synsets and classes of nouns, it is necessary to make a more detailed analysis of the semantics of the participants in the situation. The basic principles on which the work is based are accounted for here.

The documentation of the semantic and syntactic compatibility of verb units underlies the semantics of understanding. The comprehension of the semantic-conceptual information aims to

present the necessary tools for the correct interpretation of the verb phrase. The analytical comparison of the structural and semantic data from Framenet and Wordnet aims to define the most accurate information for each synset considered, summarising the results with respect to the semantic frame and class of verbs. The analysis of the syntactic and semantic data observed in Framenet leads to a more detailed characterisation of each of the observed verbal synsets in Wordnet. For the description of the frame elements the results of the research of S. Leseva et al. are partly used (Leseva et al. 2018).

The conceptual structures of frames with more than 10 encounters of synsets pertaining to them are mainly considered. These are the following frames: Perception_active, Perception_experiencer, Perception_body, Scrutiny, Cause_to_perceive, Give_impression, Make_noise. All core and non-core frame elements of these frames are considered and defined. A detailed analysis of the core frame elements has been made, including definition, semantic restrictions, syntactic category, syntactic function and admissible prepositions (non-exhaustively).

We will add the term "perceiver" to the "subject of perception", as well as "phenomenon" to "stimulus of perception", as they correspond more precisely to the terminological apparatus of the frame theory. The frame element *Stimulus* in frame theory is rather used for verbs of emotion, and *Experiencer* is the emotion undergoer.

Perception_active

@Framenet **Definition:** The frame contains perception verbs, whose perceivers voluntarily direct their attention to some entity or phenomenon for the purpose of perceptual experience.

The perceiver is active and his role in this frame is **Perceiver_agentive**.

The core frame elements (FE) are the Perceiver_agentive, who performs a certain volitional activity in order to have a perceptual experience, and the Phenomenon - the entity to which the Perceiver directs his attention. Usually the Perceiver_agentive is expressed with an external argument, and the Phenomenon - with an object.

Unexpressed core elements:

Body_part. This element marks the sensory organ used by the Perceiver_agentive and is usually expressed by a PP.

(1) *Пробвай водата с пръстчетата на крака, преди да влезеш.*

This frame element appears inconsistently within the frame, as most perception verbs contain the used part of the body implicitly. For example, visual perception is necessarily related to the organs of vision. It is usually found with verbs for tactile perception, which do not imply which part of the body is used.

In some rare cases, the frame element specifies exactly how the action is performed.

(2) *Взрях се в капитана със здравето си око.*

Direction is used to denote expressions describing how the attention of the recipient is directed during the act of perception, excluding those which name Location_of_perceiver.

(3) *Осъзнаваше, че Кабраксис го наблюдава през прозореца на каретата.*

Core FE	Definition	Semantic restrictions	Syntactic category	Syntactic function	Possible prepositions (linking words)
Perceiver_active	A person or other animate entity, who with the help of the senses perceives consciously and controlledly objects or events; the focus is voluntarily directed to a specific source.	Animacy (+) Consciousness (+) Internal control (+)	NP	Subject	–
Phenomenon	An object or event that is perceived by the perceiver.	Animacy (+/-) Eventivity (+/-) Concreteness (+) Abstractness (-) State of affairs (+/-)	NP PP S	Object, Adverbial, Clause	В, във, към
Body_part	A part of the body that is directly involved in perception without undergoing a change.	Concreteness (+) Animacy (+) Body part (+)	NP	Adverbial	С, със
Direction	A place, a spatial point, or sequence of spatial points that describes the trajectory of the percipient's attention.	Location (+) Concreteness (+)	NP	Adverbial	В, във, към, през (there can be an adverb instead of an object - напред, назад)

Table 10. Core frame elements of predicates of Perception_active frame .

Perception_experience

@Framenet **Definition:** The frame describes perception verbs whose perceiver experiences the act of perception without necessarily intending to do so. For this reason, the perceiver within this frame is called the Perceiver_passive. The frame also includes lexical units that are not related to a specific type of perception and which we categorised as general perception: усещам:3, усетя:4, чувствам:4, почувствам:4, улавям:1, уловя:1, долавям:1, доловя:1. As we have considered cases in

which higher verbs in the hierarchy can replace lower positioned verbs, we also observe concretisation through the type of Phenomenon or the organ of perception, and in some cases - both. That is why *усещам*:3, *усетя*:4, *чувствам*:4, *почуствам*:4 literals are found mainly in terms of gustatory and olfactory perception. Whereas *улавям*:1, *уловя*:1, *долавям*:1, *доловя*:1 cover all types of perception.

(4) *С ъгълчето на окото долови някакво движение.*

(5) *Патрицията долови разговор.*

(6) *Докато я търсеше, долови далечен звук и ушите му щръкнаха.*

(7) *Носът му долови миризмата на храна.*

(8) *Дали рецепторите ми не са толкова изтънчени, колкото се предполага, но не долових вкуса на кокоса в общото съчетание.*

Core frame elements:

Body_part - the place in the body of the Perceiver_passive in which the perceptual experience takes place. It is usually syntactically expressed by a PP.

(9) *Тя усети на врата си студеното докосване на перата по бузата му, а после топлината на устните му върху мекото на ушите си.*

Unspecified types of perception often represent this frame element because the perception is not localised in a specific part of the body. It is possible that it is expressed in more specific types of perception.

(10) *Усетил си вкуса на гроздовите зърна с небцето си.*

In the case of verbs that are ambiguous in terms of active-passive perception, the use of this FE distinguishes between the two types.

(11) *Той мина бързо край купчината развалини и подуши с нос.*

Perceiver_passive indicates the subject of perception, not necessarily consciously aimed at it. It is usually syntactically expressed with an external argument.

(12) *Дори от таква голямо разстояние Кара можеше да надуши апетитното им уханье.*

Phenomenon - marks the entity or stimulus that the perceiver experiences with their senses. It is usually in the position of a direct object.

(13) *Но скоро видяхме едно много забележително чудовище.*

Core FE	Definition	Semantic restrictions	Syntactic category	Syntactic function	Possible prepositions (linking words)
Perceiver_passive	A person or other animate being who perceives elements	Animacy (+) Consciousness (+) Internal control (-)	NP	Subject	—

	of the world around him; the perception takes place without conscious control.				
Phenomenon	An object or event that is perceived by the percipient.	Animacy(+/-) Eventivity (+/-) Concreteness (+) Abstractness (-) State of affairs (+/-)	NP S	Object, Clause	
Body_part	Part of the body with the help of which the perception is performed or which directly participates in it without undergoing a change.	Concreteness (+) Animacy (+) Body part (+)	PP	Adverbial	С, със, на, върху

Table 11. Core frame elements of predicates of Perception_experience frame.

Perception_body

@Framenet **Definition:** This frame contains words describing physical experiences that can affect any part of the body. The corresponding part of the body is almost always explicitly named, traditionally with the help of an external argument. At the sentence level, the Experiencer in Bulgarian language can be coded as an accusative (*главата ме боли*), dative (*възглавницата ми убива*) and possessive (*обажда ми се гастритът*). In rare cases, the Experiencer is expressed with an external argument, and the FE Body_part - as an object (*имам болки в цялото тяло*).

(14) *Ръцете и краката го боляха, в началото леко, после болката стана все по-силна, накрая — непоносима, като в същото време гласовете добиваха все по-голяма яснота.*

Core frame elements:

Body_part - this frame element names the location within the body where the physical experience takes place, usually expressed by an external argument or a PP.

(15) *Нещо го бодеше между ребрата. Дръжката на меча му.*

(16) *Орязаната ѝ коса бодеше брадичката ми и единственото нещо, за което можех да мисля, бе колко много я обичам.*

Experiencer - Experiencer is the animate entity who experiences physical sensation - internally or externally in a part of the body.

Core FE	Definition	Semantic restrictions	Syntactic category	Syntactic function	Possible prepositions (linking words)
Experiencer	An animate participant in the situation who experiences physical sensation.	Animacy (+) Consciousness (+) Internal control (-)	NP	Subject, Object	
Body_part	A part of the body that names a specific area of physical sensation without undergoing a change.	Concreteness (+) Animacy (+) Body part (+)	NP, PP	Subject, Object	В, под

Table 12. Core frame elements of predicates of Perception_body frame.

Scrutiny

@Framenet **Definition**: This frame deals with situations in which the Cognizer is an animate or intelligent entity who pays attention to the Ground in order to detect or note an inherent feature of the object. The Cognizer may be interested in a certain characteristic or entity, the Phenomenon that is part of the Ground or contained in the Ground (or to make sure that such a feature or entity is not present).

Core frame elements:

Cognizer - carefully studies a certain entity in order to discover something about it. This frame element is usually represented by an external argument.

(17) *Таргон **прегледа** доклада набързо.*

Ground - the medium which serves as a background or a context of the Phenomenon.

(18) *Тя с професионално око оглеждаше **влажния тунел** [GROUND] за пукнатини [PHENOMENON].*

Instrument - an entity that the Cognizer uses and directs and that interacts with the background to accomplish the scrutiny.

(19) *Техникът инспектира машината с **лазерен нивелир**.*

Medium - a part of a text or work on which the attention of the Cognizer is focused in order to find some information. It is usually expressed by an external argument.

(20) ***Втора глава** разглежда Ръселовата философия в контекста на дилемата.*

Core FE	Definition	Semantic restrictions	Syntactic category	Syntactic function	Possible prepositions (linking words)
Cognizer	An animate or quasi-animate entity, most often a person who performs a cognitive or mental activity in order to establish or discover a certain fact or knowledge, to form an opinion or attitude.	Animacy (+) Organisation (+/-) Consciousness (+) Internal control (+/-)	NP	Subject	–
Ground	An object or place in the context in which the Phenomenon occurs or can be noticed.	Location (+)	NP	Object	
Instrument	Physical entity, most often a special device that is used as an aid by the Cognizer to realise perception.	Concreteness (+) Solid body (+)	PP	Indirect object	С, със
Medium	A physical or abstract entity, most often a piece of artefact, text or work, containing the information sought by the Cognizer.	Concreteness (+/-) Abstractness (+/-)	NP	Subject	–

Table 13. Core frame elements of predicates of Scrutiny frame.

Cause_to_perceive

@Framenet **Definition:** An Agent, Actor, Entity or Medium causes a Phenomenon to be perceived by a Perceiver. The Perceiver is usually unspecified if an Actor, Entity or Medium is present.

(21) Тя [ACTOR] демонстрира интерес към изложените картини [PHENOMENON].

(22) *Единствено на Фродо [PERCEIVER] (той) [AGENT] показвал книгата [PHENOMENON] за пътешествието, която пишел.*

(23) *Сцената [MEDIUM] представя „бърлогата“ [PHENOMENON] на полковник Калун, събрал на малък гуляй неколцина от съседите си плантатори.*

(24) *Сателитните снимки показват, че всичко е чисто.*

(25) *Икономиката [ENTITY] показва признаци на възстановяване [PHENOMENON].*

Core FE	Definition	Semantic restrictions	Syntactic category	Syntactic function	Possible prepositions (linking words)
Actor	A rational being who, intentionally or unintentionally, exhibits an object to the Perceiver so that it can be perceived.	Animacy (+) Consciousness (+) Internal control (+/-)	NP	Subject	–
Agent	A rational being who intentionally exhibits an object to the Perceiver so that it can be perceived.	Animacy (+) Consciousness (+) Internal control (+)	NP	Subject	–
Entity	A physical or abstract object that demonstrates an inherent fact or situation so that they can be perceived.	Concreteness (+/-) Abstractness (+/-)	NP	Subject	–
Medium	An object that expresses the context in which the Phenomenon is recognizable.	Concreteness (+/-) Abstractness (+/-)	NP	Subject	–
Perceiver	A person or other animate entity who perceives elements of the world around him; perception can be carried out	Animacy (+) Consciousness (+) Internal control (+/-)	NP, PP	Object	на

	voluntarily or without conscious control.				
Phenomenon	An object or event that is perceived by the percipient.	Animacy (+/-) Eventivity (+/-) Concreteness (+) Abstractness (-) State of affairs (+/-)	NP, S	Object, Clause	

Table 14. Core frame elements of predicates of Cause_to_perceive frame.

Give_impression

@Framenet **Definition**: This class of perception predicates presents the Phenomenon, which is typically expressed by an external argument, and its perceptual characteristics are given a specific description. This can be Characterization, describing purely perceptual properties, Appraisal, giving information about a positive or negative evaluation, or Inference concerning a non-perceptual property based on the Perceiver_passive's opinion.

Core frame elements:

Appraisal - a positive or negative judgement, given to the Phenomenon.

(26) *Гласът ми звучеше ужасно — сякаш бях плакал за нещо.*

Characterization - a subjective description of the Phenomenon, made by the Perceiver_passive.

(27) *Ярката боя по фасадата му изглеждаше никак сивкава и безжизнена.*

Inference - expresses a certain quality of the Phenomenon, which is not directly related to the specific sensory modality, but is based on perception within this type.

(28) *Звучиш разочарована от новината.*

Phenomenon - is typically expressed as an external argument of the verbs in the considered frame.

(29) *Гласовете звучаха гръмко и съвсем наблизо.*

FE	Definition	Semantic restrictions	Syntactic category	Syntactic function	Possible prepositions (linking words)
Appraisal	Positive or negative judgement of the Phenomenon.	Feature (+) Abstractness (+)	AdvP	Adverbial	
Characterization	Subjective description	State of affairs (+) Proposition (+)	AdvP	Adverbial	Като, сякаш, никак

	expressed on the basis of similarity.				
Inference	Indirect quality or feature that the Perceiver_passive derives based on direct perception.	Abstractness (+) State of affairs (+)	AdvP	Adverbial	
Phenomenon	An object or event that is perceived by the percipient.	Animacy (+/-) Eventivity (+/-) Concreteness (+) Abstractness (-) State of affairs (+/-)	NP	Subject	–

Table 15. Core frame elements of predicates of Give_impression frame.

Make_noise

This is the most numerous group, with 48 synsets to which this frame is assigned.

@Framenet **Definition:** A physical entity called the Sound_source emits Sound. This includes humans and animals that make sounds with their vocal organs. The frame does not include situations where the sound extraction is the result of contact with objects (collision or friction). Cases in which an animate Agent or natural force causes sound extraction are considered in the Cause_to_make_noise frame.

Core frame elements:

Noisy_event - an event involving one or more Sound_sources and is accompanied by Sound.

(30) *Караниците [NOISY_EVENT] кънтяха из целия квартал.*

Sound - the frame element is very often incorporated in the meaning of the verbs to which the frame is ascribed. Otherwise it is assigned an NP.

(31) *Ехтеше и ехтеше адският звук, отекваше през виещите хълмове и над водите на Люлката на Нага, разбиваше се в планините на Голям Уик и се връщаше, ехтеше и ехтеше, докато не изпълни целия мокър свят.*

Sound_source - attributed to a constituent naming the physical entity that emits the sound (e.g. machine, musical instrument).

(32) *В далечината шумеше тракторът.*

Core FE	Definition	Semantic restrictions	Syntactic category	Syntactic function	Possible prepositions (linking words)
Noisy_event	The situation that predetermines the	State of affairs (+)	NP	Subject	–

	emission of sound signals.				
Sound	The sound signal emitted by the Source or accompanying the Noisy_event.	Abstractness / Concreteness	NP	Subject	–
Sound_source	An object or spatial point from which sound signals are emitted.	Location (+) Concreteness (+)	NP	Subject	–

Table 16. Core frame elements of predicates of Make_noise frame.

These frames exhaust the basic and most numerous subclasses of verbs.

Conclusions

The dissertation is a comprehensive study of perception predicates and presents a comparison with the class of mental predicates where their graphic realisations coincide. The dissertation proposes a model for formal presentation of predicates for the needs of word sense disambiguation. Unlike other authors, we include the maximum number of predicates in whose meanings underlie the semantic components "perception", "perceiver", "perceived", even in their potential representations. Thus, in addition to the traditionally studied active and passive predicates of perception, we also include Stimulus-oriented, interoceptive and proprioceptive verbs, which occupy a peripheral position in the considered semantic class.

The introductory Chapter 1 defines the predicates for perception and the basic terminological apparatus used in the study. The object, goals and tasks of the scientific work are postulated. The central role of semantics is justified, as well as the choice of the resources for its analysis. The perspective for the study of perceptive predicates as primary in terms of ambiguity and the intersection with the cognitive class is clarified. A model for presenting the Bulgarian predicates of perception by means of a formal description according to the purposes of the word sense disambiguation is proposed.

Chapter 2 presents the topic of meaning. Basic theoretical statements in the field of lexical meaning and semantics' coding are discussed. The parameters of monosemy, polysemy, homonymy and metaphorical usage of perception verbs in traditional and formal-semantic research are discussed. The research of heterogeneous semantics regardless of its belonging to polysemous, homonymous or metaphorical relations is justified. Paradigmatic, syntagmatic and conceptual criteria for defining individual senses are outlined and systematic models for vocabulary presentation are described. In the second part of the same chapter the concept of automatic word sense disambiguation is defined and

various methods for its implementation are introduced, which are grouped according to the described sense-distinction criteria. Difficulties facing the automatic word sense disambiguation are discussed, as well as guidelines for overcoming them.

Chapter 2 gave motivation for the choice of the presentation of the perception-predicate semantic features and the necessary combination of linguistic data to facilitate the correct word sense disambiguation.

Chapter 3 provides an analytical overview of fundamental semantic- (J. Trier, B. Levin, I. Kasabov, S. Koeva) and aspectual classifications of predicates (L. Shcherba, Z. Vendler, D. Dowty, R. Van Valin and R. LaPolla among others), which present systematic linguistic specifics of vocabulary units. The semantic primitives ascribed to Wordnet synsets, which were used in predicate analysis, are listed. Particular perception-verb typologies (A. Viberg, J. Leech, E. Paducheva, S. Moiseeva) on which we rely for the typology of the Bulgarian predicates for perception are also presented. The division of A. Viberg into active, passive and copulative perception predicates has been studied in detail, as well as his later subdivision of the copulative type into sensory copulas, perceptibility verbs and sensory verbs. Almost all of the presented classifications follow the three main subclasses of A. Viberg. S. Moiseeva makes an exception by defining 4 subclasses according to the main participant (object or subject) and the type of perception (active or passive). The main features that affect verbs of perception are characterised and described. These are the orientation of a verb towards the Subject or Stimulus, agentivity / non-agentivity, causativity / non-causativity. All of them are used in the typology of the Bulgarian perception predicates in Chapter 4 of this study.

In Chapter 4, in accordance with the set tasks, the typological features of the verbs for perception are studied. The prototype meanings of the perceptive predicates are described, as well as the characteristic derivation models of the considered class of predicates. The lexical-semantic paradigm and the manifestations of ambiguity in the class of perception verbs are studied. An analysis of the connections of perceptive predicates with other semantic classes is carried out. A typology of Bulgarian perceptive verbs is proposed on the basis of contemporary general and thematic verbal classifications. The verb orientation is taken into account - having the Subject / Experiencer or the Object / Stimulus as the sentential subject, the volitional control of the external argument over the situation - active perception / passive perception (agentivity / non-agentivity), real perception / potential perception (causativity, inchoativity, negation). The oppositions active perception - passive perception and subject-oriented and object-oriented perceptive verbs are discussed. On this basis, 210 of the considered 342 synsets are grouped into 3 main types according to the projection of the sentential subject (Subject-oriented and Stimulus-oriented perception) and 18 main types - according to different sensory modality (for each of the 5 sense modalities and one for general perception). The remaining 132 synsets are grouped into 12 other types based on the above-mentioned features and incorporating some of the three components of potential perception - causativity, inchoativity, negation. The non-prototypical meanings of the main verbs from each group are also formulated and

illustrated with examples from the Bulgarian National Corpus. Non-prototypical meanings are grouped by the types of verbs for perception and according to the different semantics they encode. The greatest freedom of semantic derivation is shown by the verbs from the visual perception field, which realise a significant number of non-prototypical meanings, predominantly with cognitive semantics.

In Chapter 5 the attention is focused on the syntactic aspect of the uses of different types of meanings, derived in Chapter 4. The canonical representatives of perceptive predicates are considered and their syntactic realisation within different senses is illustrated. The last part of the chapter is dedicated to frame theory and each of the meanings is presented with its specific frame. The distribution of frames by number and types of predicates is illustrated in tabular form. The frame elements of predicates, their semantic restrictions, the types of constituents, their syntactic function in a sentence and possible prepositions are defined. All frame elements are illustrated with language material from the Bulgarian National Corpus.

The examples show that the lexical-semantic information is also expressed through the syntactic realisation of arguments and is coded in their semantic restrictions. For perceptive predicates, the restrictions imposed on the perceiver are broader - *animate entity*, while mental predicates require the presence of *reason*. Regarding the Stimulus, *physical concreteness* is needed with perceptive predicates and *abstract entities* - with mental ones. In other words, the typology of predicates, the correct formal description of their structural characteristics, as well as the semantic restrictions of the main arguments realised in individual senses, would further work on automatic word sense disambiguation, which is essential for computer modelling of the semantic diversity in linguistics.

The research confirmed the working hypotheses that (1) there is a direct connection between the realisation of senses and the semantic-syntactic features of the perceptive-predicate arguments; (2) predicates, realising both perceptive and mental sense, encode their arguments and complements differently in structural or semantic terms; (3) the description of the individual senses of perceptive predicates, which also develop cognitive semantics, of their arguments and their syntactic functionality in different meanings leads to greater clarity in the automatic word sense disambiguation.

Contribution

1. The dissertation presents the semantic class of perception predicates in its completeness. A comprehensive semantic and syntactic study of perceptive predicates has been carried out with a view to their formal representation for the purposes of automatic word sense disambiguation. The changes occurring in the structural use due to the extension of meaning of lexical units have been analysed.

The study includes predicates for potential perception (*изглеждам, звуча*), for general perception modality (*усещам, чувствам*), for interoception (*боли, стяга*) which have not been considered by other authors in their descriptions of perceptive verbs in Bulgarian.

2. A model for analysis and description of verbs has been proposed, with the help of which the observed interactions between semantics and syntactic realisation have been studied and presented.

The methodology is applicable to different groups and subgroups of predicates.

3. Bulgarian verbs for perception have been analysed and typologized according to their way of coding the subject of perception, as well as in view of their ability to mean various additional aspects (inchoativity, causativity, negation).

4. A classification of the Bulgarian predicates of perception is presented, which has been expanded and enriched in comparison with the existing classifications on the basis of their prototypical and non-prototypical senses. The former include meanings of sensory perception and their semantic derivation within the same semantic class. Non-prototypical senses extend beyond the semantic field of perception. They have been typologized according to the sensory modality of their primary meaning and the semantic class of the derivative.

5. The interdependence between the lexical diversity of the Bulgarian verbs, the types of arguments and complements they select, their semantic constraints and the types of subordinate relations has been outlined.

6. Highlighting the distinct senses of primary perceptive predicates, which also develop cognitive semantics, their arguments and syntactic realisation in different senses leads to greater clarity in their study and application in various resources for natural language processing.

7. The purpose of the analysis as stated in the subtitle requires that the results of the research find practical application in the development of programs for word sense disambiguation and automatic translation, in translation practice, in learning Bulgarian as a native language, as well as in differentiated modelling of the training process in the study of Bulgarian by foreigners.

Selected publications related to the topic of the dissertation

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